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U.S. ARMY CORPS OF ENGINEERS

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APRIL 15, 2003

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1 MR. HEADLEY: Like to welcome the folks that
2 can make it tonight. Wish we could have had a little bit
3 bigger crowd. If you have cell phones, if you don't mind,
4 put them on silent or turn them off if you're like me and
5 can't figure out how to do. If you didn't sign in, please
6 do so before you leave. And I have my card and I think
7 Brian has his cards up there. If you need to reach us for
8 anything, you're welcome to take a card.

9 The agenda for tonight's meeting, I'll be
10 doing the introduction. I'll turn it over to Brian Condike
11 with the U.S. Army Corps of Engineers who did the project
12 overview. Dr. Todd Anderson with Texas Tech will do the
13 ecological evaluation parts. Ron Hartline with Montgomery
14 Watson Harza, MWH, will do the watershed studies section.
15 And then Brian will wrap up the conclusion for the day.

16 My name is Kyle Headley. I'm an electrical
17 environmental planner for the Brazos River Authority. My
18 job duties/responsibilities include managing all the
19 environmental projects in the central basin of our river
20 basin, which my area runs from Erath County in the north
21 down to Williamson County in the south. I'm involved in
22 all the environmental projects in that area. That's all
23 about me.

24 Here's a listing of the project team members
25 and just a real brief description of their duties and their

1 roles in this project. U.S. Army Corps of Engineers, their
2 management and technical support. BRA, technical services
3 and stakeholder coordination. The Institute of
4 Environmental and Human Health, Texas Tech through the
5 toxicological and ecological studies. Montgomery Watson,
6 watershed hydrological studies, Transport and GIS. The
7 State Motor Alliances serves as advisory to the study team
8 and also community interface. TCEQ, formerly known as
9 TNRCC, is also adviser to the study team and liaison with
10 interagency Perchlorate Energy Committee. That's a
11 national committee. U.S. EPA -- we're tickled to death
12 he's here tonight -- is also advisory to the study team and
13 regulatory liaison. Here's a listing of the stakeholder
14 alliance that was formed. This was formed early on in this
15 project of Central Texas. This group of stakeholders was
16 very instrumental in securing the funds that supports this
17 project through trips to Washington, et cetera, et cetera.

18 These entities that are represented in this
19 slide, that's your cities and other entities that draw
20 water from Lake Belton and Lake Waco for drinking water
21 supply. Those two reservoirs, Lake Belton and Lake Waco,
22 are your primary sources that could be impacted from
23 perchlorate originating from the Naval Weapons Industrial
24 Reserve Plant in McGregor. That's why these are of such
25 interest in this project.

1 Brazos River Authority has been kind of the,
2 I guess, the point of contact for these other entities.
3 And what I do is just pass information on to these guys
4 primarily by e-mail. As I get information, I pass that on
5 to them every chance I get to make sure they're aware of
6 everything that's going on. So that's my role with that.

7 Here's just a big kind of a plane's view of
8 the area. And y'all may have all seen this a hundred
9 times, but we're going to show it again just to kind of
10 bring everything back in perspective. Some of you may be
11 new to this project. I'm not sure. But hopefully this
12 will give you a little background.

13 That little white section in the middle
14 there, that's the old Naval Weapons Industrial Reserve
15 Plant. It's now part of the U.S. Navy. And here -- this
16 dividing line right here that divides those two watersheds
17 and determines which way the water flows, everything to
18 the -- this side, the southeast side flows toward Lake
19 Belton. Everything on the northeast and the easterly side
20 flows through Harris Creek, South Bosque and down to Lake
21 Waco. This is Station Creek at the Leon River heads into
22 Lake Belton. That's just an overview of that.

23 Another area of interest to the local folks,
24 the navy, their primary goal in this project, is to be able
25 to transfer this over 9,000 acres to the city of McGregor.

1 And to do that they've got to meet TCEQ and other cleanup
2 regulations and specifications to be able to transfer that
3 property over there. And thus far, they have transferred
4 all the green properties. Let's see. Greens, the purples
5 were just recent and the D and portions of the side of S,
6 this large area M is due to be transferred in November of
7 '04. And then towards the last quarter of '06 they intend
8 to have the entire property transferred to the city of
9 McGregor. They've transferred about 6,000 acres so far.
10 So we're about two thirds of the way there as far as the
11 volume of the property. And that's really all for my
12 section and I'm going to turn it over to Brian.

13 MR. CONDIKE: Thank you, Kyle. Good evening.
14 I'm Brian Condiike. I'm a project manager and environmental
15 project manager for U.S. Army Corps of Engineers in Fort
16 Worth. This perchlorate project in the Waco/Temple area is
17 under my responsibility. Tonight I'm going to talk a
18 little bit about the authority and the funding which this
19 project is based. The project goal was developed by the
20 project team, our community outreach efforts and the
21 objectives of the project.

22 In fiscal year 2001, Congress appropriated 4
23 million dollars under public law 106-277, which says in
24 part directs the corps in coordination with federal
25 agencies and the Brazos River Authority to assess the

1 impact of perchlorate from the former Naval Weapons
2 Industrial Reserve Plant in McGregor. The following year
3 in fiscal year 2002, Congress appropriated another 2.1
4 million for a total of 6.1 million dollars. The original
5 intent under public law was to allocate 8 million dollars
6 for this project. We've determined after this point in
7 time that we're not going to need the additional funds. We
8 should be able to finish this project for 6 million dollars
9 or less.

10 The project team first assembled in February
11 of 2000, came up with this succinct goal for projects to
12 evaluate potential human environmental exposure to
13 perchlorate. Project team consisted of the list of folks
14 that was on the first slide, the Brazos River Authority,
15 city of Waco, Texas Tech University, Montgomery Watson
16 Harza, Corps of Engineers.

17 Early on we decided that we needed to keep
18 the community informed of our efforts. There was a lot of
19 interest in the community about perchlorate from the naval
20 plant. We started out with interviewing some of the local
21 stakeholders. And based upon that, we developed a
22 community relations plan. Community relations plan
23 included plans to have meetings with the stakeholders and
24 that list of water suppliers that Kyle referred to. We've
25 had two of those so far. Also to have a series of public

1 meetings of which this is one in the series. This is the
2 fourth public meeting we've had. We've had briefs with
3 federal elected officials in Washington, both Congress and
4 staff from senators' offices. We've developed a public
5 access website. The benefits of these efforts are to
6 ensure that all the community members know what we're doing
7 on a project, what we're accomplishing and also to give
8 them an opportunity to give us some input on what our
9 activities are. Try to demonstrate the website. There we
10 go. This is a representation of what our website looks
11 like. In the menu category of project information we have
12 descriptions of the scope of work for our contractors and
13 our schedule. We have a series of maps which people can
14 download and look at. One of them is this last one on the
15 list of recent perchlorate concentrations, a series of
16 maps. This one shows the -- our sampling stations from
17 Naval Weapons Industrial Reserve Plant in the low left-hand
18 corner to the northeast. This is along Harris Creek series
19 here, series along the south Bosque River. And the
20 visitor's website -- find my cursor again. Click on any
21 sampling station and retrieve our actual handling data for
22 any date. And we have similar maps for other sections of
23 the project. List of public notices and project director
24 media reports, public meetings and project meetings.
25 Project meetings include publication of the team meeting

1 notes for all our project team meetings. This is a
2 universal listing of the website address, the address for
3 our website.

4 The overall goal that we developed has a list
5 of objectives which go along with it. Listing here the
6 first few have check marks next to them meaning that we
7 have completed them, we have a community relations plan.
8 We've compiled an exhaustive bibliography of all the
9 existing study area information which the navy has
10 generated in several years of work on site. We asked
11 ourselves several questions. And under the auspices of our
12 project goal is what information do we need to answer these
13 questions. We looked at the information we had, looked at
14 the information we needed. And the difference is what we
15 call the data gap, a hole in our knowledge which would
16 enable us to answer the questions on the project goal.
17 Based upon that analysis we defined and developed a
18 conceptional study model which is conceptual summation of
19 all the information we have and how the watersheds involved
20 work in terms of how the surface water and groundwater flow
21 from the Naval Weapons Industrial Reserve Plant to the two
22 reservoirs involved. Based upon the gaps of data that we
23 had, we developed field sampling plans, which would
24 generate new data and fill these gaps. Right now we're in
25 the process of actually implementing the field

1 investigations to gather data, fill the data gaps. From
2 that information, we will evaluate what happens to
3 perchlorate when it gets into the environment, where it
4 goes. We're also going to evaluate the environmental
5 exposure to perchlorate study area as well as the human
6 exposure area. These are the two major items under our
7 project goal. As part of that process, we're going to
8 discuss the exposure pathways of perchlorate to vegetation,
9 fish, mammals. And if they're exposed, to assess the
10 impact from those exposed.

11 When we're all done gathering all this data
12 and evaluating what it means, we're going to integrate it
13 all into one final report and assess the ecological risk.
14 Regulatory environment in which we operate right now, there
15 is no maximum contaminant level in drinking water from
16 perchlorate. The state Texas Commission on Environmental
17 Quality, TCEQ, has developed an interim action level of
18 four parts per million drinking water. They've developed
19 guidelines for groundwater of 4 to 7 parts per billion
20 respectively for residential and commercial uses
21 groundwater. And a 4 part per billion standard for
22 surface.

23 Federal government has not developed a
24 maximum contaminant level. Right now they're evaluating a
25 proposed -- what would I call it, Cheryl?

1 MS. OVERSTREET: It's toxicological risk
2 assessment. Is that what you mean?

3 MR. CONDIKE: The one part per billion
4 dollars that --

5 MS. OVERSTREET: Right. That's part of the
6 risk characterization, toxic part.

7 MR. CONDIKE: Standard target action level.

8 MS. OVERSTREET: It will be the toxicity
9 value that will be incorporated into an NCL. It's
10 something you would find on IRIS, which is Integrated Risk
11 Information System.

12 MR. CONDIKE: The federal government has
13 proposed a risk value developed per billion. Right now
14 that's being evaluated by the National Academy of Sciences.
15 At this point, the federal government has no formal
16 standard for perchlorate. Right now I will turn this over
17 to Todd Anderson, Texas Tech. And please feel free to ask
18 questions while we're giving this. Small group here,
19 pretty informal.

20 MR. ANDERSON: I'm happy to be here on behalf
21 of several scientists of Texas Tech, and we're looking at
22 the potential impact perchlorate has on wildlife species.
23 I'm going to go through some of our data, not all of it.
24 If you have questions along the way or need further
25 explanation, please feel free to interrupt.

1 Our goals were to first start out by
2 identifying the -- what I call the points and pathways of
3 exposure, places where we knew from monitoring data that
4 perchlorate occurred. And then based on where those
5 occurrences were, what the potential was for movement of
6 perchlorate out of surface water and into aquatic organisms
7 or riparian organisms or even terrestrial organisms.

8 Part of that involves assessing the impact or
9 potential impact that perchlorate may have on fish and
10 amphibians, also looking at mammals and birds. And then
11 ultimately taking a lot of that information and thinking it
12 in models. These are pharmacokinetic models to look at how
13 perchlorate behaves in an individual organism and then our
14 link to population models that take that individual
15 organism as part of a population so that you can predict or
16 maybe simulate what the potential long-term impacts might
17 be for a particular exposure scenario.

18 Just to sort of summarize, I guess, what
19 we've learned at this point related to the points and
20 pathways of exposure, we have some variation in water
21 concentration depending on season. There are a couple of
22 areas in particular. Station Creek we've detected
23 perchlorate here. There's a spring that feeds into Harris
24 Creek, actually about right here. And an unidentified
25 tributary of the South Bosque that basically originates

1 near where that area S landfill would be on a previous map
2 that Kyle showed. There's a couple -- there's one
3 exception to the variation of season. The spring on
4 Oglesby Road here has relatively consistent perchlorate
5 concentration regardless of time of the year or rainfall or
6 whatever.

7 We have learned that within the sediments
8 around the facility that perchlorate is persistent in
9 seven. That's primarily due to the fact that until you get
10 rid of the nitrate in the system, you're not going to get
11 rid of any of the perchlorate. The microorganisms that
12 live there much prefer to use nitrate as the electronic
13 sediment prior to using any perchlorate. Because of
14 certain activities around the area, there's plenty of
15 nitrate in all those surface waters from fertilizer runoff
16 or from manure. There's all kinds of activities that lead
17 to the occurrence of nitrate in those water bodies.

18 The persistence in sediment is a significant
19 issue just because in flowing water you have the
20 opportunity for there to be perchlorate present in the
21 water and then not present. These pulses of exposure. But
22 if you have sediment that has perchlorate in it, then it
23 essentially serves as a source or potential source for
24 perchlorate in that overlying water under those cases where
25 you don't have perchlorate flowing in the water. So that's

1 an important point when we're looking at points and
2 pathways of exposure.

3 We've also detected perchlorate in
4 vegetation. Most of that data comes from the spring on
5 Oglesby Road. And we've looked at both in the laboratory
6 and in the field how perchlorate gets into plants, what are
7 some of the environmental conditions that influence how
8 much perchlorate gets in the plants. And what we're trying
9 to do is maybe identify what's its fate once it gets into
10 plant. Is it sequestered somehow. We don't think that's
11 the case, but we're going to look some of those processes
12 in the laboratory.

13 We've concluded based on some of our open
14 water catchable size fish sampling that human exposure to
15 perchlorate through contaminated fish is highly unlikely.
16 And that's based on the fact that perchlorate doesn't occur
17 in some of the consumed tissues. It occurs in certain
18 tissues but not tissues that are typically consumed. The
19 places where we have sort of significant levels of
20 perchlorate here and here, those streams don't necessarily
21 support large or aquatic life. So there really isn't any
22 fish there to catch. And we also have to some extent --
23 well, we have -- some of the fish that we've caught are
24 shocked and in the open water in Lake Waco and Lake Belton,
25 those catchable size fish, we've had one instance where we

1 found perchlorate in some of those fish, so -- at least in
2 the edible tissue, so it's just really not very likely to
3 occur. We're going to continue that work to maybe expand
4 the tempo and nature of that data. But we've concluded
5 that that's pretty unlikely.

6 This is just an example of some of the data
7 that we have related to perchlorate vegetation. And this
8 is some data from a stream which is sort of identified by
9 this vertical line here and then distance from the stream
10 in various perchlorate levels in leaf tissue. And we've
11 done that. Actually there's another -- we have some
12 December data as well in looking at -- you see a trend for
13 perchlorate increasing as you go through the summer. Even
14 in cases where you have trees that are quite a bit of
15 distance away from the stream itself, you can find
16 perchlorate in the leaf tissue of that. Those are parts
17 per million dry weight numbers. So that's a potential
18 pathway for exposure to small mammals or birds and those
19 are some of the studies that we're following up on.

20 One of the current -- some of our current
21 focus is to look at release of perchlorate from vegetation.
22 We've looked at putting out these leaf litter traps to see
23 if perchlorate is released. There's some sort of
24 preliminary data that indicate that it does. Even though
25 it gets taken up into the plant, those leaves fall to the

1 ground and there's rainfall events. Perchlorate can come
2 out of the leaves and be washed out. We're also looking at
3 transformation of perchlorate in vegetation. That would be
4 a good thing because it might get rid of the mass
5 perchlorate that would be available to be taken up by a
6 higher organism.

7 And then finally I don't have a lot of detail
8 on this but the plan is to do one of these sort of market
9 basket type surveys where we look at the potential for
10 perchlorate to get into garden vegetables that may be grown
11 and irrigated with water that's contaminated with
12 perchlorate.

13 Okay. Impacts on fish and amphibians. We've
14 collected a variety of data here. I'm only going to show a
15 few sets of slides. We've looked at thyroid histology.
16 The perchlorate affects the thyroid, you see changes in
17 thyroid histology. We've observed that both in frogs and
18 in fish. This is an example of some of -- these are -- the
19 axis here would be hypertrophy. It's not indicated by --
20 it got left out of the graph here. After a relatively
21 short exposure even at some pretty high concentrations, you
22 don't really see any changes in thyroid histology. But
23 with longer term exposure, even at this relatively low
24 concentration of 38 parts per million, that's a certainly
25 environmentally relative concentration for this particular

1 site. We see changes in thyroid histology. What that
2 means exactly as far as the survivability of the frog or
3 the fish, those are some of the things that we have to
4 follow up on.

5 We've also seen changes in male offspring
6 upon exposure to perchlorate. Some of the frog data where
7 we look at -- without any sort of perchlorate exposure,
8 it's typical to have more females than males in a batch of
9 frogs or eggs that hatch. When you have perchlorate
10 exposure you get an increase in the number of females or
11 decrease in the number of males. The ratio changes and at
12 really high concentrations those aren't terribly
13 environmentally relevant at this site. Even at these lower
14 concentrations, you see changes in the numbers of males and
15 females. Well, that kind of information is really useful
16 in these modeling exercises. You can put those types of
17 changes into population models and look at what the
18 long-term impact is on those changes from males to females.

19 MR. CONDIKE: Those numbers significant, is
20 that indicating fewer offspring as you go to higher
21 concentrations?

22 MR. ANDERSON: I don't know. I don't know if
23 they've -- these are just hatched. So they're not really
24 looking at -- they're not necessarily taking only the eggs
25 that hatch or the eggs that develop, I guess. So they've

1 exposed tons and tons of eggs and they're just looking
2 at -- they count, you know, a certain number of them, a
3 percentage.

4 One of the good things is that we've found
5 that at least in frogs anyway the effects are reversible.
6 That sort of ties into the fact that you have flowing water
7 in that system. And you may have these impacts, you know.
8 It doesn't look like you have any short-term impacts but
9 prolonged exposure you do. But if those animals are taken
10 out of that system or the water gets cleaned, those frogs
11 at least can start to develop. You have sort of this
12 arrested development typically upon perchlorate exposure
13 especially at high concentrations. But if you take away
14 that perchlorate, as long as there's enough iodine in that
15 system, the frog will start to develop normally. So the
16 effects are reversible there. There isn't a case -- unless
17 the animal dies -- there are cases where they can recover
18 at least in frogs from that exposure.

19 This is some -- I guess some more recent data
20 where we looked at native frogs and looked at thyroid
21 histology of cricket frogs and try to develop some
22 relationships between where we see these changes in thyroid
23 histology and where we see at least monitoring data
24 indicates that the average perchlorate concentration is the
25 highest. And there's an issue here because you're taking a

1 snapshot. The endpoint that you're using is sort of a
2 snapshot. It's a one time measurement. And the exposure
3 data is more, you know, where it changes with time. So
4 trying to make really solid relationships between these two
5 is a little bit difficult and dangerous I guess at some
6 level. But there do seem to be a relationship between
7 where we see these changes in thyroid histology in native
8 frogs and places where we see higher than usual levels of
9 perchlorate.

10 The current focus related to potential
11 impacts on fish and amphibians is to look at continuing
12 these histological, thyroid histological assessments in
13 both frogs and fish. We're going to do some developmental
14 assays, complete environmental assays with native frogs.
15 Collect cricket, frogs or eggs and use water from the study
16 area for various places and look at these sort of complete
17 developmental assays. Most of the assays that we do are
18 limited in the stages that you look at because thyroid
19 hormones only control certain parts of that environmental
20 process. We're going to do these little bit longer term
21 developmental frogs, developmental assays using native
22 frogs. And then we're going to continue to look at
23 perchlorate in edible tissue. These are catchable size
24 fish, look at perchlorate in filet tissue just to make sure
25 that we're -- that what we observed at least last season or

1 over the course of the last year wasn't just an anomaly.

2 Okay. Impacts on mammals and birds. We
3 believe that there's significant risk to small mammals and
4 small birds that occupy the area, at least the areas that
5 we've sampled. We found pretty high concentrations of
6 perchlorate in kidneys and livers of both small mammals and
7 small birds. One of the issues is that there isn't really
8 a very good relationship between the residues in liver and
9 the residues in kidneys. Some cases we find it. Typically
10 the kidney numbers are higher, but there isn't a real
11 consistent pattern in that data. So we observed the same
12 type of thing when we looked at fish in our initial
13 assessments of fish. And we were able to sort of figure
14 that out a little bit better by doing some laboratory
15 studies that looked at tissue distribution of perchlorate
16 and obtain kinetics of uptake and excretions. So we're
17 going to follow up some these small mammals and small bird
18 studies with some tests to look at tissue distribution.
19 That's one of the -- one of the areas we're currently
20 focusing on.

21 Because of the fact that we've found
22 perchlorate in small mammals, we've also looked at medium
23 sized mammals, raccoons and possums. We have sort of a
24 limited sample there. We haven't picked up any perchlorate
25 in those animals. And we didn't observe any dramatic

1 changes in thyroid hormones for those animals compared to
2 where they were caught.

3 We're still going to follow up some of those
4 studies with some assessments on larger mammals. And we
5 have an ongoing study with cattle because an interest in
6 the potential for human exposure through cattle as well as
7 the fact that there's a lot of ranching and grazing in
8 areas around the study site.

9 And then a project that's not really related
10 to -- not directly related to the work that we're doing
11 here but an interesting sort of sideline. One of the
12 impact or thyroid hormones in addition to playing critical
13 roles in development also play critical roles in an
14 animal's ability to thermally regulate -- thermal
15 regulation. And that would be a case where it would
16 compromise the survivability of an animal because they're
17 not able to thermal regulate. So that kind of information
18 could also go into one of these population models to look
19 at on a certain exposure you can compromise an animal's
20 ability to thermally regulate. We know from the literature
21 that decreases the survivability. We can plug that
22 survivability into one of those population models and look
23 at the potential long term of that.

24 Last, as I mentioned, we want to look at
25 these modeling exercises to look at long-term exposure and

1 effects or potential effects. And as I mentioned these
2 models are pharmacokinetic models that look at how
3 perchlorate distributes in tissue and how that -- what
4 potential impact that might have. And then the individual
5 fish make up a population and you see changes, declines in
6 population with time because of the fact that the animal's
7 not -- they're not able to reproduce or their survivability
8 is decreased by exposure to a particular contaminate, in
9 this case perchlorate. And these models in some cases are
10 3D models and they incorporate sort of a random swimming of
11 the fish and how that random swimming changes their
12 exposure depending on the parts of the water column that
13 they might occupy. So you can do a lot of sort interesting
14 things and probability type of things with these models to
15 look at, you know, putting numbers, putting some sort of
16 quantitative number on the potential impact.

17 The downside to these models is that it's
18 relatively easy to make them, but unless you have some good
19 data to validate them or to sort of refine them, they don't
20 really -- they're not going to be that useful. So one of
21 the things -- the current focus is to continue to collect
22 some of that environmental data that we can use to sort of
23 refine these models and make them more useful.

24 Okay. With that, I'll turn it over to Ron.

25 MR. HARTLINE: I'm Ron Hartline and I'm the

1 project manager for MWH in charge of overseeing the
2 watershed studies that are being performed as part of the
3 project. Basically my job was to oversee all the sampling
4 activities and goals associated with understanding how
5 water flows from the source area near through the
6 groundwater systems into the streams and ultimately through
7 the watersheds to the dams in both lakes. Our watershed
8 study components, what we started out with was a
9 conceptual. We did some detailed data collection efforts
10 so we could develop a conceptual site model. We went out
11 to BRA here at Baylor University, collected a lot of the
12 onsite reports from the navy and remediation reports and
13 assembled a group and port to identify data gaps that
14 needed to be filled as part of our investigation. These
15 are some of the data gaps we wanted to look at as part of
16 our investigation.

17 We have longitudinal stream sampling where
18 we're sampling -- set up 15 sampling stations within the
19 watersheds and collecting biweekly -- biweekly water
20 samples from each station. We currently have a station set
21 up in storm mode waiting on a storm to come through the
22 area and be doing some storm sampling. We'll also be
23 collecting surface water and setting up for water samples
24 and algae samples from Lake Waco and Lake Belton. We'll
25 also be performing acoustic doppler and profiling the

1 performance in quality and also some flow modeling within
2 the lake specifically Lake Belton and understand the flow
3 patterns within the lake if there are some different
4 pathways we need to look at. Ground water dye tracer
5 studies and also perform an diagnostic study of Lake Belton
6 to determine which is natural that may be occurring in the
7 lower parts of the lake.

8 This is our current project schedule. We
9 started the longitudinal stream sampling. We set up the 15
10 stations last year in October and initially sampled 21
11 days. And that will continue on a biweekly basis through
12 the end of the project. So we will have a significant
13 amount of data regarding surface water conditions
14 throughout the watersheds within the project. We're
15 currently about to start the storm sampling events. We're
16 also monitoring the intakes of Lake Waco, Belton on monthly
17 basis. Delta area study will start during the summer.
18 Perform the first acoustic doppler profiler study. Talk
19 about that here in a minute. Ground water study also
20 scheduled for this summer and ecological evaluation with
21 Texas Tech has been performing that since day one with a
22 detailed report of all these activities.

23 Before we started working on this specific
24 activity, we learned to develop detailed study sampling
25 work plans that would help guide us during our field

1 activity so we would know the goals that we want to reach
2 at the end of each sampling activity. As part of that we
3 developed field sampling plans for each of these field
4 tasks. All of those have been completed to date except for
5 the groundwater dye tracer study which we should complete
6 within a couple of months.

7 The longitudinal stream sampling stations,
8 this is what they look like. Inside this box there's a
9 flow meter and this sampler, automatic sampler that will
10 hold 24 sample containers. We have these set up on --
11 between NWIRP Lake Belton, NWIRP Lake Waco and one on
12 Cowhouse Creek. We have 15 of these total. On the Station
13 Creek side, we have six sampling stations. And this is the
14 locations that are pretty well distributed throughout the
15 watershed. We have a similar setup on Harris Creek,
16 between Harris Creek and Lake Waco and along the south
17 Bosque to Lake Waco. These are fairly well distributed
18 along the watershed so we could get an idea how perchlorate
19 concentrations might vary from location near the plant as
20 you move towards Lake Waco.

21 There was one detection. It was kind of an
22 anonymous reading that the navy had in Lake Belton at one
23 point in time. As part of the study we also chose to
24 install the one automatic sampling station here on Cowhouse
25 Creek. This station is monitored in the same fashion as

1 the other stations. And to date we haven't had any
2 detections out of that station.

3 These are the results that we obtained from
4 three of the sampling stations that extend -- this starting
5 near NWIRP. It's called Tripanum (phonetic) at the A&M
6 property. This is moving downstream. This sampling
7 station is at Station Creek near Oglesby Neff Road. And
8 the final location here is along the Leon River. Basically
9 what this graph shows is that as you near McGregor you see
10 we're getting consistent detections above 4 parts per
11 billion in the majority of our samples. As you move
12 basically halfway downstream, we're getting most of our
13 analyses are below 4 parts per billion, which is the
14 reporting limit. We do have some estimated quantities
15 above method detection limit. Looks like one hit above 4
16 parts per billion in all of the samples that's been done
17 since October. We can also see all the samples along Leon
18 River has been undetected perchlorate.

19 This graph is similar to the other graph as
20 we just showed you except it's on the NWIRP to the Lake
21 Waco side. One of the things to note is the concentration
22 is significantly less on this side or in this watershed
23 compared to the Station Creek side. We do get
24 significant -- or hits above 4 parts per billion pretty
25 consistently as on the Harris Creek side near NWIRP. And

1 as we move downstream again we're seeing much lower
2 concentrations here in all cases below the reporting limit.
3 And as we get closer or to the middle Bosque, we're seeing
4 all nondetect concentrations again primarily.

5 This graph is showing surface water levels,
6 groundwater levels and rainfall relationships within some
7 of the streams. At each of these sampling stations, we
8 have a monitor installed and it has a continuous
9 groundwater level detection equipment installed. We also
10 monitor stream height in each stream so we can compare
11 groundwater to the stream height data. In this case, you
12 can see groundwater elevation of this area is higher than
13 the stream height of -- which indicates that groundwater is
14 moving into the stream at which we could call the naval
15 stream. Also see how with the significant rainfall events,
16 groundwater is very similar to surface water in terms of
17 increased stream life.

18 Okay. This is another graph similar to the
19 one I just showed with the exception as you can see ground
20 water level in this case is below the stream level. And
21 this is basically reverse of the other graph showing a
22 losing stream where the water in the stream is actually
23 losing water to ground water. Again, this case you can see
24 that the levels tend to follow each other. So it appears
25 they are well connected.

1 We did our first acoustic doppler profiler
2 study in March of this year. What we did is we divided the
3 lake into 21 transects, and we took a boat out to the lake,
4 the acoustic doppler ADCP equipment. We drove the boat
5 across each one of these transects to detect flow data at
6 each transect. We'll be doing this three additional times
7 during the project so we can look at trends between the
8 seasons. And we plan on doing three more of those studies
9 throughout the project.

10 This is the type of data that we're getting
11 at each transect location. This is basically a cross
12 section of one transect that helps us determine the overall
13 flow across the cross section and also gives us some
14 indication to preferential flow pathways here near the
15 bottom of the stream. This shows greens and reds are
16 higher areas or increased velocity. We have several of
17 these boxes together here which is indicating preferential
18 flow pathway. Some of these are indicating that there may
19 be preferential pathways along the river channel in the
20 lake and in other instances follow it and other contour
21 features at the bottom of the lake.

22 At each transect we also take temperature
23 profile. As you can see here, we have a pretty distinct
24 climb around 8 meters below the surface and we saw that in
25 most of the transect locations that we sampled during our

1 first sampling. And we'll see how that varies through each
2 of the seasons as well.

3 The final component of our portion of the
4 project is to develop detailed geographic information
5 system where we've collected all this data from the navy.
6 They provided all their monitor logs, all their surface
7 water data, lake sampling data. Texas Tech has a lot of
8 data that they provided to us. Data that we're collecting.
9 Assembling all this into geographic information system that
10 we can use for evaluation toward the end of the project.

11 I was just going to get a demonstration of
12 some of the things that we plan to do in the future. This
13 just -- kind of gives you an idea NWIRP McGregor or as you
14 move toward monitor well station locations along Trib M.
15 As you move down, this is creek -- we've got a station
16 along the creek. This is just right before the confluence
17 of the Leon River. We also have a station -- it's Mother
18 Neff Park on the Leon River. And this is just to give you
19 an idea what kind of things we hope to do later on when we
20 have a lot of data. We have a lot base layer of data in
21 our data base now.

22 This is just another example. What we've
23 done down here is we've taken the old river channel and
24 overlaid it on to pathometric survey of Lake Belton. The
25 transect locations in the future we'll be able to tie in

1 some of the flow data that we received and see if these
2 intersect with the river channel and see if there's any
3 preferential flow pathways. Also maybe we'll do some water
4 balancing on the lake with some of this data. GS is just
5 going to provide us a tool to use in evaluating significant
6 amounts of data we collected both on site and off site.
7 Turn it back over to Brian Condiike.

8 MR. CONDIKE: One of the other things is
9 picking up a task that the navy has been performing for us
10 for four years. That is collecting samples at some of
11 these portable water tanks on Lake Waco and Lake Belton.
12 MWH and BRA are collecting the samples from five locations
13 on Lake Belton. These are intake structures that portable
14 water suppliers use. And the city of Waco is collecting
15 from the intake structures on Lake Waco.

16 We started this in January of this year and
17 today we have got no detection of perchlorate in any of
18 these intake structures, similar to the navy's results.
19 They never got a detection of perchlorate. We did miss the
20 February 2003 sampling on Lake Belton because of an ice
21 storm.

22 The work that still needs to be accomplished
23 before our project work is complete, we need to finish our
24 field investigation in collecting this data to fill our
25 data gaps. We are continuing development of our GIS system

1 and adding data to it as we generate it. Texas Tech is
2 going to complete their ecological and toxicological
3 assessment study. We're going to take all this information
4 and using the tool GIS and perform a comprehensive
5 evaluation of the potential exposure to humans and
6 environmental perchlorate which was our original goal. Tie
7 that all up into a final published report which is due to
8 be completed next February.

9 The preliminary results, much of this has
10 been said previously, is that perchlorate concentrations do
11 vary in surface water depending upon the location, where
12 the samples were collected, season when they're collected
13 and whatever the stream fall events. As Todd Anderson said
14 perchlorate is apparently consistent in sediment as long as
15 there's nitrate present. All biological activities
16 preferential the nitrate. Perchlorate we are finding it in
17 various plants species in both perific and terrestrial
18 vegetation. We're finding it in small mammals and birds.
19 It does not appear to be affecting amphibian metamorphosis.
20 Apparently that's been true in other locations in Texas
21 where there's been much higher concentrations of
22 perchlorate.

23 Perchlorate is apparently affecting fish
24 tissues. It can affect the frog reproduction in terms of
25 in the numbers that are produced. We're starting to

1 identify which streams are gaining streams and losing
2 streams and even some of these streams switch from one to
3 the other depending on the water level, ground water level.
4 Also starting to identify the preferential flow patterns in
5 Lake Belton and continue that through three more rounds of
6 USACE measurements.

7 Perchlorate concentration reduced
8 significantly as the water travels away from and inward.
9 We're finding them in small streams and around the NWIRP
10 plant. But as they reach the major rivers, the Bosque,
11 Cowhouse Creek, we don't detect perchlorate at all. None
12 of the intake samples have protected perchlorate. That's
13 where we are today, that's where we are going. We'll
14 entertain any questions.

15 AUDIENCE MEMBER: Is this presentation on
16 your website?

17 MR. CONDIKE: It will be. Next website
18 update will be?

19 MR. GANDHI: End of the month.

20 AUDIENCE MEMBER: Your URL for that website?

21 MR. CONDIKE: Go back to that.

22 MR. SMITH: I was curious as to the
23 presentation Todd was giving on the mammals. How are you
24 going about studying cattle?

25 MR. CONDIKE: You want to speak up, Todd.

1 MR. ANDERSON: We have an area where
2 perchlorate concentration in a stream -- we have an area
3 where the perchlorate concentrations in the stream are
4 relatively consistent. And it's also small enough so that
5 we can isolate some animals there. So we have two animals
6 that we're -- we've placed on that site and then we have
7 two more that were purchased at the same time and placed on
8 what's called a reference site. So every couple of weeks
9 we'll take -- we take water data in both places. We take
10 blood samples from all four animals. And we also attempt
11 to take urine. And what we'll do is use the blood samples
12 to look at thyroid hormones and also to look at potential
13 for perchlorate in plasma. And at the conclusion of the
14 study those animals will be processed and we'll take a look
15 at various cuts of meat and do resin analysis.

16 MR. CONDIKE: Sir, you have any more
17 questions?

18 AUDIENCE MEMBER: No.

19 MR. CONDIKE: Cheryl, Bob?

20 MS. OVERSTREET: Drinking water is pollutable
21 level.

22 MR. CONDIKE: Your description. Thank you.

23 MS. OVERSTREET: I have a delayed reaction
24 sometimes.

25 MR. CONDIKE: I have not known what to call

1 it. That's a new term for me. Anything to add, Dave?

2 MR. EBERSOLD: I'm good.

3 MR. CONDIKE: Ron, Kartik, Kyle, Tom?

4 (All move head side to side.)

5 MR. CONDIKE: Thank you all for coming
6 tonight. You've been a wonderful audience.

7 (End of meeting.)

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<p>A</p> <p>ability 20:14,20</p> <p>able 4:24 5:2 6:8 19:13 20:17 21:7 28:25</p> <p>about 2:23 5:9,10,18 6:19 11:24 23:15,19 31:24</p> <p>above 25:10,15,15,24</p> <p>Academy 10:14</p> <p>access 7:5 9:9</p> <p>accomplished 29:22</p> <p>accomplishing 7:7</p> <p>acoustic 22:25 23:18 27:1,4</p> <p>acres 4:25 5:9</p> <p>across 27:5,13</p> <p>action 9:17 10:7</p> <p>activities 7:9 12:14,16 22:4 23:22 30:15</p> <p>activity 23:24 24:1,2</p> <p>actual 7:21</p> <p>actually 8:25 11:24 14:11 26:22</p> <p>ADCP 27:4</p> <p>add 33:1</p> <p>adding 30:1</p> <p>addition 20:12</p> <p>additional 6:7 27:6</p> <p>address 8:2,2</p> <p>adviser 3:9</p> <p>advisory 3:7,12</p> <p>affect 30:24</p> <p>affecting 30:19,23</p> <p>affects 15:16</p> <p>after 6:6 15:20</p> <p>again 4:9 7:20 26:1,4 26:23</p> <p>agencies 5:25</p> <p>agenda 2:9</p> <p>algae 22:24</p> <p>alliance 3:14</p> <p>Alliances 3:7</p> <p>allocate 6:5</p> <p>along 7:18,19 8:5 10:24 24:16,18 25:8,17 27:19 28:14,16</p> <p>amount 23:13</p> <p>amounts 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